

## PATENT SPECIFICATION

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DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

## Reclining Chairs

I, ANTON LORENZ, a citizen of the United States of the United States of America, residing at Ocean Ridge, Boynton Beach, Florida, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to improvements in Reclining Chairs, and more particularly to such devices which are adapted to have both a first and second movement to respective different positions from the usual upright or sitting position.

Chairs constructed for double movement, as proposed and in use heretofore, are built with a seat and back, relatively movable, and with a leg rest adapted to be moved into a supporting position for co-ordinating action in response to the movements of the seat and back portions. Various provisions have been suggested heretofore for coordinating the several parts of the chair or the like, some of which have not functioned to full practical extent. It is desirable to obtain adjustment of the parts of the chair, either to tilting or full reclining positions, and to dispose the leg rest in a coordinated position with respect thereto, whereby the occupant can be accorded either a comfortable sitting position, partly reclined, or a completely inactive or relaxed position.

One object of this invention is to provide, in a chair, for adjustment of the seat and back either to a tilting position or to a full reclining position, and to coordinate therewith the adjustment of the leg rest so it will be disposed in comfortable relation to the

positions of the seat and back rest.

Another object of the invention is to improve the construction of reclining chairs so as to obtain smooth and uniform adjustment to the different positions desired, both of the seat and back rest, and also of the leg rest.

Still another object of the invention is to improve the means for synchronizing the movements of the leg rest with the adjustment of the seat and back to provide either tilted or full reclining positions, and so as to obtain full and effective adjustment as desired.

The present invention consists in a reclining chair comprising a support, body-supporting means including a seat and back-rest adapted to move from a sitting position through a first movement phase to an intermediate tilted position and through a second movement phase to a reclining position, a link associated with the back-rest and pivotally connected to said seat at a seat pivot, said link extending rearwardly from said seat pivot blocking means operative between said seat and back-rest to establish a prescribed angular relationship therebetween during said first movement phase, said blocking means being arranged to preclude movement of said seat and back-rest toward each other during said first phase and to permit movement of said seat and back-rest away from each other during said second movement phase to increase the angular relationship therebetween to establish a reclining position, front guiding means pivotally mounted on said support at a first pivotal mount and pivotally connected to said seat at a first pivotal connection, and rear guiding means pivotally mounted on said support at a second pivotal mount and pivotally

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connected to said link at a second pivotal connection spaced rearwardly of said seat pivot.

Certain embodiments of the invention and illustrated in the accompanying drawings, in which:

Figure 1 is a diagrammatic side elevation of a reclining chair, in which the back rest is upright and in sitting position, and the chair is provided with the improved double movement linkages of this invention.

Figure 2 is a view similar to Figure 1, showing the parts in tilted position and with the leg rest extended;

Figure 3 is a similar view, showing the parts in full reclining position;

Figure 4 is a view similar to Figure 3, of a modified form of linkage and foot rest extension;

Figure 5 is a view similar to Figure 1 of the modified form, the back rest being upright in sitting position; and

Figure 6 is a view similar to Figure 2 of the modified form.

Referring first to the form of chair shown in Figures 1, 2 and 3, this illustrates one embodiment of the invention. The chair comprises a suitable frame and supporting structure, having opposite end or side sections, generally indicated at 1, connected together or joined by suitable frame parts 2 and 3, respectively. The sides 1 constitute arm rests. The frame may also include suitable feet or legs if needed. These parts are so constructed as to form a rigid frame for supporting the operative parts of the chair.

A chair seat is shown at 4 and a back rest at 5, which may be of any suitable or desired form and structure. A leg rest is shown at 6. These parts are suspended and supported by the frame structure of the chair and are adapted for relative adjustment for movement to different positions through sets of linkage provided according to this invention. The sets of linkage are located at the respective opposite sides of the chair, being duplicated at both opposite sides for uniformity of movement. The linkage at only one side will be described, it being understood that a like linkage is provided at each opposite end of the chair.

The seat 4 has an arm 7 extending therefrom to the back rest 5 at each opposite side of the latter, and is pivoted thereto at 8 intermediate the length of the arm 7. The protruding end of the arm 7 on the opposite side of the pivot 8 opposite from the seat 4 is in position to engage a stop lug 9 secured to the adjacent end of the back rest 5,

when these parts 4 and 5 are in their relative positions, as shown in Figures 1 and 2, but permitting swinging movement of the back rest 5 about the pivot 8 in a clockwise direction, as illustrated in Figure 3.

The back rest 5 is supported upon a guiding link 10, pivotally connected at 11 with the back rest 5 and pivotally supported at 12 on the adjacent frame side 1. The guiding link 10 thus forms a movable support at each opposite edge of the back rest 5, supporting the latter and the adjacent portion of the seat 4, but is mounted for bodily movement upon swinging movement of the guiding link 10 between the positions shown in Figures 1 and 2. As the lower edge portion of the back rest 5 moves bodily rearward upon rocking movement of the link 10, the latter engages a fixed stop 13 carried by the adjacent side 1 or extending between the sides, if desired, as an additional frame brace.

Secured to the underside of the seat 4, somewhat forwardly of the transverse center thereof, is a bracket 14 provided with a stop surface or abutment shoulder 15 thereon. A guiding link 16 is pivotally connected at 17 to the bracket 14 and extends downwardly therefrom substantially to the frame member 2. In the normal position of the seat 4, the guiding link 16 extends upwardly from the member 2 in an inclined direction slightly tilted forward of an upright plane through the lower end of this link.

The lower end of the guiding link 16 is pivotally connected at 18 with a control link 19. The opposite end of the control link 19 is pivotally connected at 20 with the adjacent side 1 of the chair. This control link 18, thus supported on the frame structure at 20, and pivoted to the guiding link 16, cooperates with the frame connecting member 2 to support the forward edge portion of the seat 4. The seat 4 can move bodily rearward from the position shown in Figure 1 to the position shown in Figure 2, the guiding link 16 rocking on its pivotal connection with the control link 19, until it engages the shoulder or abutment 15 which limits the relative movement of the link with respect to the seat. As soon as the link 16 reaches a position where it engages the abutment 15, there is formed a substantially rigid connection between the link 16 and the seat that prevents further

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relative movement therebetween, as the seat is moved rearward.

Any suitable means may be used, as desired, for operating the leg rest 6 in cooperative relation to the movement of the seat 4 and back rest 5. One example of such means suitable for the purpose is illustrated in Figures 1 to 3, which I have found very practical for the purpose.

In this embodiment, a lever 21 is pivotally supported at 22 intermediate its ends on the adjacent frame side 1 for rocking movement with respect thereto. The pivot 22 is shown as offset in position providing long and short arms on the lever, although the length of these arms may be varied as found desirable.

The upper end of the lever 21 is pivotally connected at 23 with a link 24 that extends therefrom to the lower edge portion of the back rest 5, to which said link 24 is pivoted at 25. Thus, upon backward swinging movement of the back rest 5 or upon backward bodily movement thereof, said back rest acts through the link 24 to actuate the lever 21 for rocking the latter on its pivot 22.

The opposite end of the lever 21 is pivotally connected at 28 with a connecting lever 27 that extends therefrom forwardly of the chair. The front end portion of the connecting link 27 is pivoted at 28 with a toggle lever 29, intermediate the length of the latter. The toggle lever 29 is pivoted at 30 on the adjacent frame side 1, and at its opposite end the lever 29 is pivoted at 31 to a toggle link 32. The members 29 and 32 cooperate to form a toggle, being actuated by the connecting link 27 and to cause movement of the leg rest 6.

The outer end of the toggle link 32 is pivotally connected at 33 with a suspension link 34 that is pivotally supported at 35 on the adjacent frame side 1 and extends therefrom to a pivot 36 on the leg rest 6.

A connecting link 37 is pivotally connected at 38 to the leg rest 6 and extends therefrom to a pivot 39 intermediate the length of the toggle link 32. These parts 32, 34 and 37 cooperate to provide the desired projecting movement of the leg rest 6 when actuated by the toggle 29-32.

Figure 1 illustrates the parts of the chair in the normal sitting position. If a person sitting in the chair wants to change it to a more comfortable semi-reclined or tilted position, it is only necessary to apply a slight pressure against the back rest 5, which will cause

the back rest 5 and the connected seat 4 to move bodily rearward with respect to the frame structure. This rearward movement is guided by the back rest guiding link 10 and seat guiding link 16 until the latter engages the abutment or shoulder 15 on the bracket 14, and the guiding link 10 engages the stop 13 secured to the frame structure. This action moves the parts to the position shown in Figure 2 and constitutes the first movement of the chair structure. The seat and back rest may be retained in that position until further movement is desired. It will be noted that during this first movement of the chair parts, the seat and back rest remain in the same relative position, but are moved bodily together, both rearwardly and in a somewhat tilted relation. This maintenance of the relative positions of the seat and back rest is accomplished by the engagement of the projecting end of the arm 7 against the stop lug 9 on the back rest.

Furthermore, during this first movement, the back rest 5 pulls rearwardly the actuating link 24, which, in turn, swings the lever 21 on its pivot 22. Such movement of the lever 21 causes the connecting link 27 to be projected forwardly to the position shown in Figure 2. The link 27 acts through the toggle 29-32 to move the leg rest 6 bodily to a forward projected position, substantially as illustrated in Figure 2. The leg rest 6 will be maintained in a comfortable relation to the seat 4 so long as the parts are in the relative positions shown in Figures 1 and 2.

With the parts in the tilted position, as illustrated in Figure 2, an appropriate action on the chair can move these parts either to the normal upright position or to a full reclining position. The parts will be restored to the upright position by downward pressure on the leg rest 6, which will act through the linkage described, to cause bodily movement of the seat 4 and back rest 5 to the normal upright position shown in Figure 1. If the user of the chair so desires, it is possible to move the parts from the tilted position shown in Figure 2 to the full reclining position shown in Figure 3 by an additional pressure applied to the back rest 5. During such additional pressure, the back rest guiding link 10 is rendered inactive because it has moved into engagement with the stop 13 and is prevented from additional movement thereby.

However, the back rest 5 is capable of swinging movement about the pivot 11 on the guiding link 10 and may swing relative thereto and relative to the seat 4 to the position shown in Figure 3. During the latter movement, the projecting end of the arm 7 will be raised off the stop lug 9 so as to allow for a greater angular relation between the seat and back rest.

The seat guiding link 16 is prevented from moving in a forward direction by reason of its engagement with the abutment 15, but may move rearwardly under control of the link 19. This rearward movement of the seat will cause an upward swinging movement of the control link 19 about its pivot 20 on the frame structure, which, in turn, will lift the forward edge portion of the seat through the guiding link 16, thereby imparting a greater pitch or tilting action to the seat.

Furthermore, the backward movement of the back rest 5 will cause an additional pulling action to be imparted to the actuating link 24, thus causing additional movement of the lever 21 and connecting link 27 to adjust the leg rest 6 outward and upward into comfortable relation to the adjusted position of the seat 4, as shown in Figure 3. In this position, the toggle 29-32 will be substantially straightened, as shown, although the adjustment of these parts may be varied, as desired. This is a second movement from the tilted position shown in Figure 2 to a full reclining position shown in Figure 3.

The first movement from the sitting position of Figure 1 to the tilted position of Figure 2 has utilized the links of a first four-bar linkage comprising the guiding links 10 and 18, the seat 4 and back rest 5 between the pivots 11 and 17, and the frame structure between the pivot supports 12 and 18. These are the links that are active during this first movement.

The second movement, from the tilted position of Figure 2 to the reclining position of Figure 3, includes the seat 4 and the link 16 as one link, and the portion of the back rest between the pivots 8 and 11, as a second link as well as the control link 19 as a third link and the link 10 with the portion of the frame structure between the pivots 12 and 20, as a fourth link, thereby forming the second four-bar linkage that is active in accomplishing the second movement described.

In the upright position, shown in Figure 1, the link 16 is prevented from moving forwardly by the leg rest linkage which is stopped by the link 29 hitting a protruding shoulder on the pin which forms the pivot 18. The link 16 cannot move forwardly at its lower end because of the action thereon of the link 19 and the action of the frame member 2, as well as the action of the link 29. However, the link 16, itself, could move forwardly at the upper pivot 17 with the seat 4, if no stop were used. As explained above, the link 29 has such stop shoulder at 28 which would stop the movement of the link 16 forwardly in the position shown in Figure 1. However, any other suitable stop shoulder may be used as desired, and it need not be on the leg rest linkage.

It will be apparent that some of the links of the first and second four-bar linkages are used in both of them, as for example, the seat guiding link 16 and the seat 4, which are used as parts of both sets of linkages. Some of the links are active during certain of the movements and inactive during others, as will be apparent from the operations as described.

A modification of the linkage structure is illustrated in Figures 4, 5 and 6, providing for the movement of the seat and back rest from an upright sitting position in a first movement to a tilted position of the back rest and thereafter to a full reclining position. The latter is illustrated in Figure 4, while the sitting and tilted positions are shown in Figures 5 and 6, respectively.

The corresponding parts are illustrated by the same numerals as in Figures 1 to 3. The seat 4 and back rest 5 are connected together through the arms 7, pivoted to the back rest 5 at 8, and having limited movement by the stop lug 9 at each opposite side of the chair or seat.

The seat 4 has rigidly connected thereto an arm 40 that extends downwardly therefrom. The lower end of the arm 40 is pivotally connected at 41 with a seat guiding link 42. The opposite end of the seat guiding link 42 is pivotally mounted at 43 on the adjacent side 1 of the frame structure. The link 42 is free to swing about the pivot 43 to the several positions illustrated in Figures 4, 5 and 6 in accommodating for movements of the seat 4.

A back rest guiding link 44 is in the form of a double arm lever, with the arms thereof somewhat out of direct alignment. This lever 44 is

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pivotally mounted at 45 on the adjacent side 1 of the frame structure. One of the arms of the lever 44 is pivoted at 46 to the adjacent end of the back rest 5, so as to guide the bodily movement of the back rest to its first tilting position, as illustrated in Figures 5 and 6. The back rest guiding link 44 is limited in its turning movement clockwise, as viewed in the drawings, by a stop member 47 which extends inwardly from the adjacent side 1 of the frame structure and may extend entirely across the chair or the like between the opposite sides.

The pivotal connection 46 between the double arm lever 44 and the back rest 5 is spaced from the pivot 8 of the arm 7. A stationary link is formed through the adjacent side 1 of the frame structure between the pivots 43 and 45, and an additional link is formed through the arm 40, the seat 4, the arm 7 and the portion of the back rest between the pivots 8 and 46. These parts, together with the links 42 and 44, constitute the first four-bar linkage.

If a person sitting in the chair applies pressure against the back rest 5, the seat and back rest will move rearwardly substantially as a rigid unit, due to the engagement of the extended arm 7 with the lug abutment 9. This movement will be guided by the links 42 and 44 in the movement of the parts from the position shown in Figure 5 to the position shown in Figure 6. During this movement, the back rest guiding link 44 will be limited by the stop 47 when the link 44 reaches the position shown in Figure 6. This is the first movement of the parts and effective for accomplishing the adjustments to the positions illustrated.

The extended lower end of the back rest guiding link 44 is utilized to actuate the linkage connected with the leg rest 6 in moving the latter from the retracted position shown in Figure 5 to the outward and elevated position shown in Figure 6. Any suitable or desired form of linkage may be utilized for this purpose which will cause an adjustment of the leg rest to a comfortable relation in respect to the position of the seat 4.

The lower end of the back rest guiding link 44 is pivoted at 48 to a first actuating link 49 which extends therefrom to a first control link 50 to which the link 49 is pivoted at 51 intermediate the length thereof. One end of the first control link 50 is pivoted at 52 on the adjacent side 1 of the frame structure. A second control link 53 is pivotally supported at 54 spaced from the pivot 52

of the link 50 thereon, whereby the links 50 and 53 extend downwardly from these pivots substantially in parallel relation.

A second actuating link 55 is pivotally connected at 56 and 57, respectively, with the lower ends of the control links 50 and 53 and extends forwardly of the chair therefrom. The opposite end of the second actuating link 55 is pivoted at 58 to the leg rest 6 at the adjacent lateral edge thereof.

A suspension link 59 is pivoted at 60 to the seat 4 at the adjacent lateral side thereof and extends downwardly from the pivot 60 in overlapping relation with the adjacent end of the leg rest 6. The lower end of the suspension link 59 is movably received within a slide member 61, capable of lengthwise movement with respect to said slide member. The slide member 61, in turn, is mounted on rollers 62 guided within a groove 63 in the leg rest 6, capable of transverse movement with respect thereto to the several positions illustrated in Figures 4, 5 and 6.

When the second actuating link 55 acts on the leg rest 6 to push this outwardly, as shown in Figure 6, the lower end of the suspension link 59 and the slide member 61 will move on the rollers 62, so as to allow an extended adjustment of the leg rest 6 to a comfortable position with respect to the seat 4. This position will be adjusted in accordance with the first and second movements of the parts and will vary as between the positions shown in Figures 4 and 6.

After movement of the parts to the position shown in Figure 6, the back rest 5 can be returned to its upright sitting position, if desired, by downward pressure on the leg rest 6 which will act through the actuating linkages 49 and 55 to restore the parts to the position shown in Figure 5. On the other hand, if it be desired to move the back rest 5 to the reclining position shown in Figure 4, an additional pressure applied to the back rest 5 will accomplish that result.

During this second movement to the position shown in Figure 4, the back rest guiding link 44 will be substantially inactive, due to the fact that its movement has been limited by the stop 47, but the back rest 5 can be tilted relative thereto by movement around the pivot 46. As the back rest 5 is thus moved, the stop abutment 9 will be moved away from the extended arm 7, thereby breaking the rigid connection

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between the seat 4 and the back rest 5, thereby allowing greater relative movement.

The seat 4 will move rearwardly with the pivot 8 between the arm 7 and the back rest 5, and such movement will raise the arm 40 and thereby the connected end of the guiding link 42, thus imparting a more tilted position to the seat 4, as will be apparent by a comparison of Figure 4 with Figure 6. This is a second movement and involves the use of a second four-bar linkage consisting of the link 42, the arm 40 with the connected portion of the seat 4 to the pivot 8 (forming one link), and the part of the back rest between the pivots 8 and 46, which are the movable links of the second four-bar linkage, and a stationary link is provided through the adjacent side 1 of the frame structure between the pivots 43 and 45 (forming one link) and the link 44. The links of the first and second of the four-bar linkages have some parts in common, while other links thereof are inactive during a portion of these first and second movements.

While the invention has been illustrated and described in certain embodiments, it is recognized that other variations and changes may be made therein without departing from the invention as set forth in the claims.

WHAT I CLAIM IS:-

1. A reclining chair comprising a support, body-supporting means including a seat and back-rest adapted to move from a sitting position through a first movement phase to an intermediate tilted position and through a second movement phase to a reclining position, a link associated with the back-rest and pivotally connected to said seat at a seat pivot, said link extending rearwardly from said seat pivot, blocking means operative between said seat and back-rest to establish a prescribed angular relationship therebetween during said first movement phase, said blocking means being arranged to preclude movement of said seat and back-rest toward each other during said first phase and to permit movement of said seat and back-rest away from each other during said second movement phase to increase the angular relationship therebetween to establish a reclining position, front guiding means pivotally mounted on said support at a first pivotal

mount and pivotally connected to said seat at a first pivotal connection, and rear guiding means pivotally mounted on said support at a second pivotal mount and pivotally connected to said link at a second pivotal connection spaced rearwardly of said seat pivot.

2. A reclining chair according to Claim 1 including a stop engaging one of said guiding means at the end of said first movement phase to establish said intermediate tilted position.

3. A reclining chair according to Claim 2 wherein said stop is positioned to engage said rear guiding means.

4. A reclining chair according to any one of the preceding claims wherein at least a portion of said front guiding means, the portion of said seat and said link intermediate said first and second pivotal connections and said rear guiding means serving as movable links during said first movement phase with a stationary link being provided intermediate said first and second pivotal mounts.

5. A reclining chair according to any one of the preceding claims wherein at least a portion of said front guide means, said seat and said link serve as movable links during said second movement phase with a stationary link being provided intermediate said first pivotal mount and the second pivotal connection.

6. A reclining chair according to any one of the preceding claims including a leg-rest mounted for movement to an elevated leg-supporting position, and means for moving said leg-rest to said elevated leg-supporting position during said first movement phase.

7. A reclining chair substantially as described with reference to Figures 1 to 3, or 4 to 6 of the accompanying drawings.

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SHEET 1

Fig. 1.

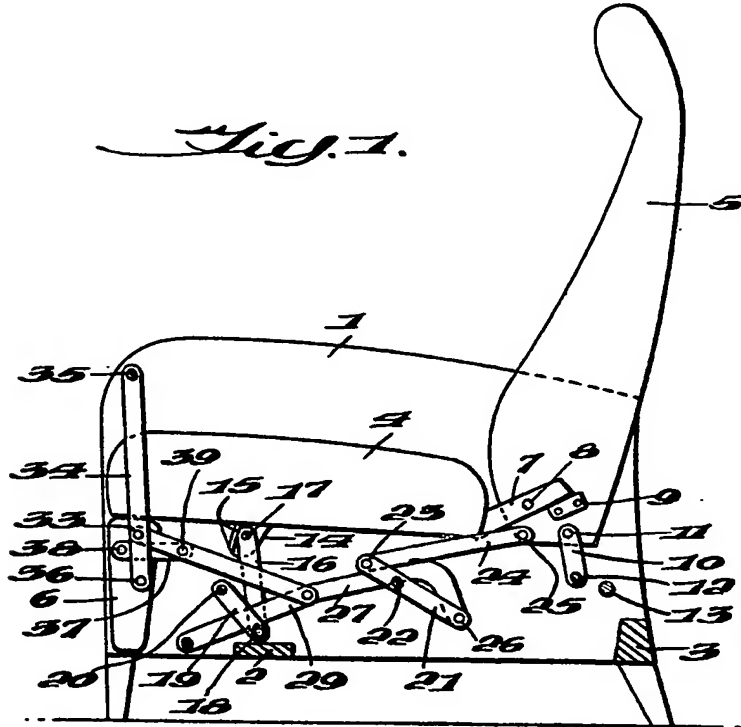


Fig. 2.

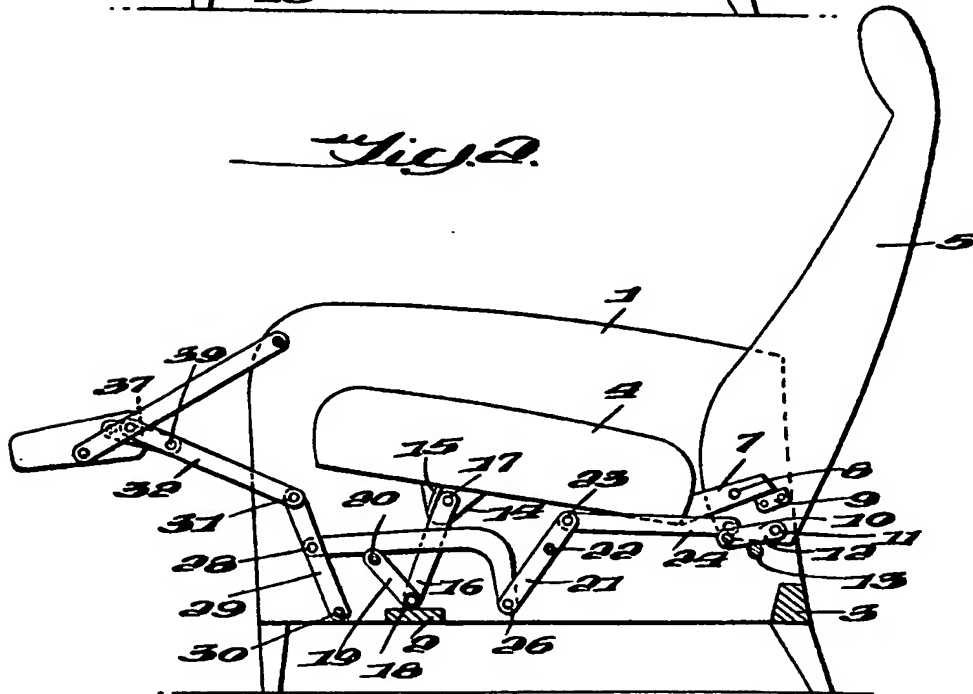


Fig. 3.

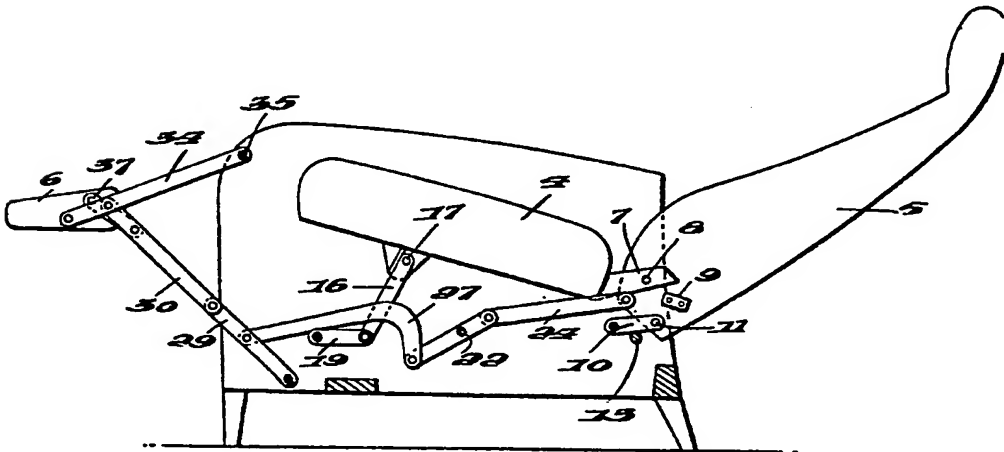
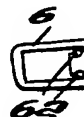
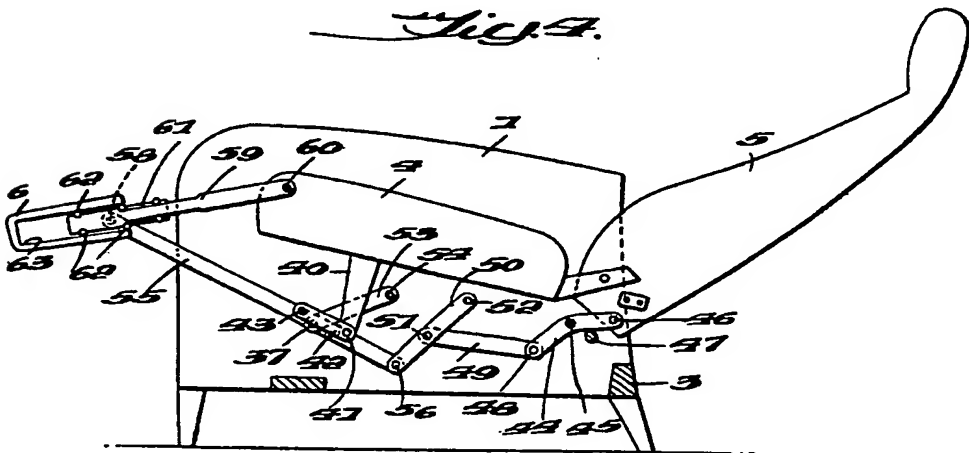


Fig. 4.





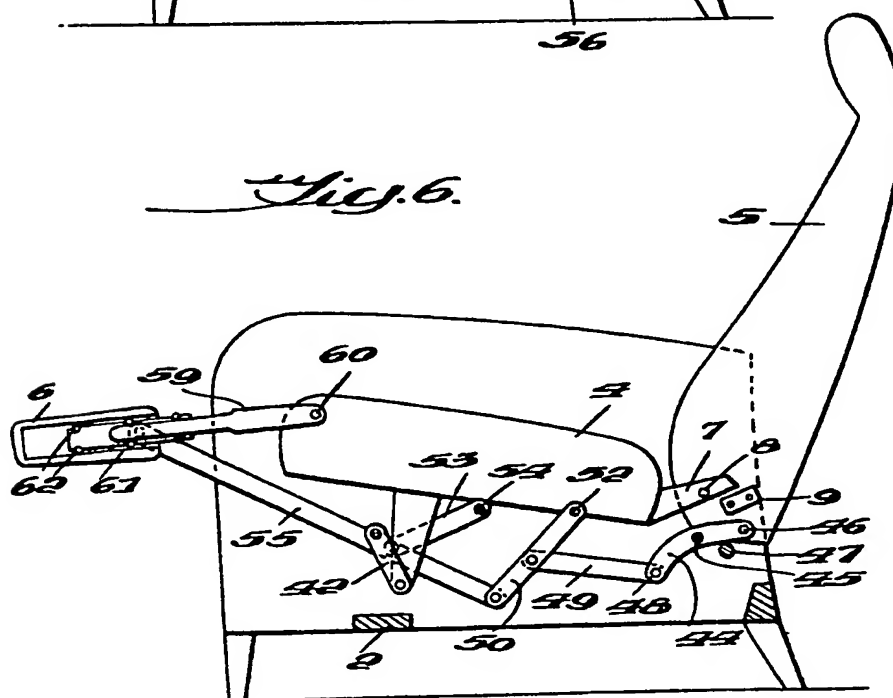
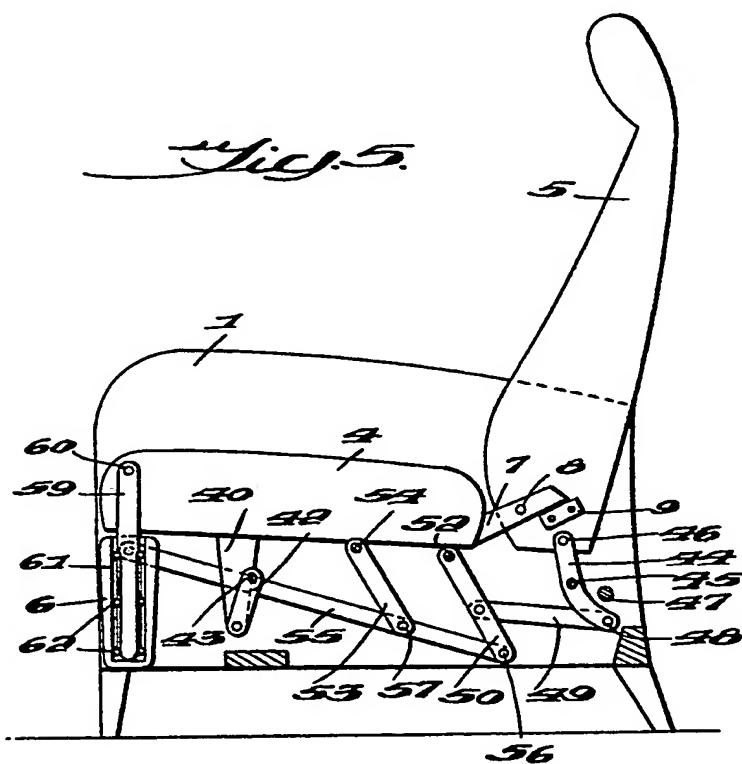
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Fig. 5.

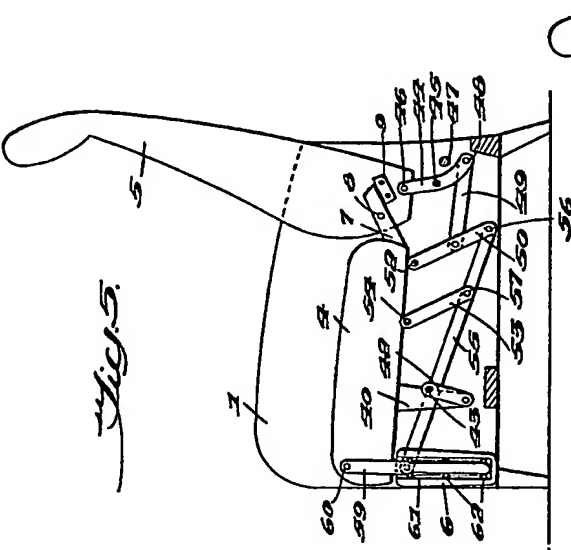


Fig. 6.

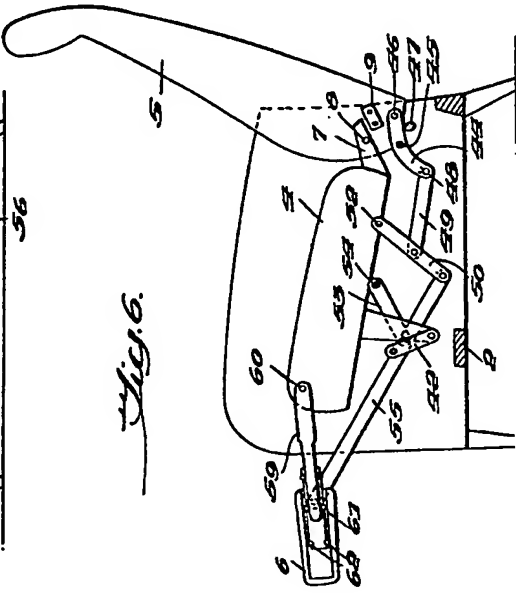


Fig. 7.

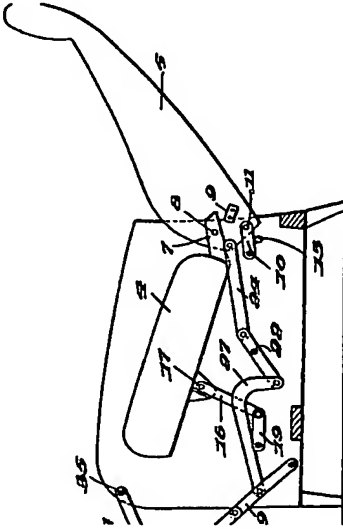


Fig. 8.

